What is claimed is:

1. A spatial position determination system comprising:

(a) a tracker unit comprising:

(1) a reference signal generator responsive to and phase-stabilized by a broadcast signal;

(2) a transmitter coupled to and phase-stabilized by the reference signal generator; and

(3) a receiver coupled to and phase-stabilized by the reference signal generator;

(b) a transponder unit coupled via field radiation to the tracker unit, wherein the transponder unit is triggered by the transmitter to produce a return signal and the receiver is responsive to the return signal; and

(c) a spatial position computer coupled to the receiver and at least one of the reference signal generator and the transmitter, responsive to indicia of a phase relationship between an output signal from the transmitter and the return signal;

whereby the spatial position computer determines a spatial position of the tracker unit relative to the transponder.

2. The system of claim 1 wherein the reference signal generator is responsive to a commercial broadcast signal.

3. The system of claim 2 wherein the reference signal generator is responsive to a commercial broadcast signal in a frequency range between about 500 kHz and about 1600 kHz.

4. The system of claim 1 wherein, during operation:

(a) the spatial position computer includes a memory cell that includes indicia of a previous spatial position; and

(b) responsive to the indicia, the spatial position computer determines the spatial position of the tracker unit relative to a source of the return signal, the spatial position being expressed as an offset from the previous spatial position.

5. The system of claim 1 wherein, during operation:

(a) the spatial position computer includes a memory cell that includes indicia of wavelength of at least the return signal; and

(b) responsive to the indicia, the spatial position computer determines the spatial position of the tracker unit relative to a source of the return signal, the spatial position being expressed as a physical measure of distance.

6. The system of claim 1 wherein, during operation:

(a) the spatial position computer includes memory cells that include indicia of a plurality of previous spatial positions; and

(b) responsive to the indicia, the spatial position computer determines the spatial position of the tracker unit relative to a source of the return signal, the spatial position being expressed as an azimuthal angle from the tracker unit.

7. The system of claim 1 further comprising a controller coupled to the transmitter and configured to periodically enable and disable signal transmission therefrom.

8. The system of claim 1 wherein the transponder comprises:

(a) a transponder reference signal generator responsive to and phase-stabilized by a broadcast signal;

(b) a transponder receiver coupled to and phase-stabilized by the transponder reference signal generator and coupled via field radiation to the transmitter; and

(c) a transponder transmitter coupled to and phase-stabilized by (1) the transponder reference signal generator and (2) the transponder receiver.

9. The system of claim 8 wherein the transponder reference signal generator is responsive to a commercial broadcast signal in a frequency range between about 500 kHz and about 1600 kHz.

10. The system of claim 8 wherein the reference signal generator of the tracker unit and the transponder reference signal generator are both responsive to the same broadcast signal.

11. The system of claim 1 wherein the transponder comprises:

(a) a transponder receiver coupled via field radiation to the transmitter and including a frequency scaler responsive to the output signal from the tracker transmitter; and

(b) a transponder transmitter coupled to the transponder receiver and phase-stabilized responsive to a frequency-multiplied signal from the frequency scaler.

12. The system of claim 11 wherein the frequency scaler includes a signal stage having a nonlinear transfer function, whereby the frequency scaled signal is a harmonic of the output signal from the tracker transmitter.

13. The system of claim 11 wherein the frequency scaler includes a digital frequency divider, whereby the frequency scaled signal is a sub-harmonic of the output signal from the tracker transmitter.

14. The system of claim 11 wherein the frequency scaler includes a direct digital synthesizer, whereby the frequency scaled signal is a rational multiple of the output signal from the tracker transmitter.

15. The system of claim 1 further comprising a digital signal processing subsystem that, during operation, implements at least portions of the eference signal generator, transmitter, and receiver of the tracker unit.

16. The system of claim 1 further comprising a control subsystem that, during operation, implements at least portions of the spatial position computer.

17. A method for processing phase information, comprising:

(a) receiving a broadcast signal at a first location;

(b) at the first location, transmitting a forward signal that is phase-stabilized to the broadcast signal;

(c) at a second location, transmitting a return signal responsive to the forward signal, the return signal having phase stability substantially corresponding to phase stability of the forward signal;

(d) at the first location, receiving the return signal and deriving an output signal with phase stability substantially corresponding to phase stability of the return signal; and

(e) using the broadcast signal and the receiver output signal to determine a phase relationship between the forward and return signals.

18. The method of claim 17 wherein receiving the broadcast signal comprises receiving the signal from a commercial broadcast transmitter.

19. The method of claim 18 wherein receiving the broadcast signal comprises receiving the signal in a frequency range between about 500 kHz and about 1600 kHz.

20. The method of claim 17 further comprising determining a spatial position of the first location relative to the second location from the phase relationship between the forward and return signals.

21. The method of claim 20 further comprising:

(a) storing indicia of a previous spatial position; and

(b) using the stored indicia to determine the spatial position expressed as an offset from the previous spatial position.

22. The method of claim 20 further comprising:

(a) storing indicia of wavelength of at least one of the forward and return signals; and

(b) using the stored indicia to determine the spatial position expressed as a physical measure of distance.

23. The method of claim 20 further comprising:

(a) storing indicia of a plurality of previous spatial positions; and

(b) using the stored indicia to determine the spatial position expressed as an azimuthal angle from the tracker.

24. The method of claim 20 further comprising periodically enabling and disabling transmission of the forward and return signals.

25. The method of claim 17 further comprising, at the second location:

(a) receiving the broadcast signal; and

(b) phase-stabilizing the return signal to the forward signal and the broadcast signal, wherein any additional phase instability of the return signal over that of the forward signal substantially corresponds to phase instability of the broadcast signal.

26. The method of claim 25 wherein receiving the broadcast signal at the second location comprises receiving the signal in a frequency range between about 500 kHz and about 1600 kHz.

27. The method of claim 26 wherein:

(a) receiving the broadcast signal at the first location comprises receiving the signal in a frequency range between about 500 kHz and about 1600 kHz; and

(b) the same broadcast signal is received at the first and second locations.

28. The method of claim 17 wherein transmitting a return signal responsive to the forward signal comprises, at the second location:

(a) receiving the forward signal;

(b) frequency scaling the received forward signal; and

(c) amplifying and filtering the frequency scaled signal and transmitting the result as the return signal.

29. The system of claim 28 wherein frequency scaling comprises transforming the received forward signal with a nonlinear transfer function, wherein the frequency scaled signal is a harmonic of the received forward signal.

30. The system of claim 28 wherein frequency scaling comprises digitally frequency dividing the received forward signal, wherein the frequency scaled signal is a sub-harmonic of the received forward signal.

31. The system of claim 28 wherein frequency scaling comprises digitally synthesizing the frequency scaled signal responsive to the received forward signal, wherein the frequency scaled signal is a rational multiple of the output signal from the tracker transmitter.

32. A system for processing phase information, comprising:

(a) means for receiving a broadcast signal;

(b) means for transmitting a forward signal that is phase-stabilized to the broadcast signal;

(c) means for receiving a return signal to derive a receiver output signal therefrom, receiving being phase-stabilized to the broadcast signal such that the receiver output signal has phase stability substantially corresponding to phase stability of the return signal; and

(d) means for determining a phase relationship between the forward and return signals responsive to the broadcast signal and the receiver output signal.